

powers, which may be most judiciously referred to the principle of least resistance, more especially as the smaller animal-cell which is in advance in division is placed in the wide obtuse pole, and thus is enabled to divide again in the long direction of the ovum.

The first division, taking place in the longitudinal direction, does not, as further observations show, divide the ovum into the materials for the right and left halves of the body, although subsequently the sagittal plane of the embryo again coincides with the long axis of the ovum. This, however, may also be referred to the least resistance as a guiding principle, seeing that both in the embryo and the egg-capsule the longitudinal exceed the transverse axes in extent.

The agreement in the position of the directive vesicles, the first divisional plane of the segmenting ovum, and the future long axis of the embryo would consequently have to be referred to a common cause, which interposed as such in each case, but without the first orientation in space being conditional for any of the following ones.

If it be considered further that the egg-capsule is furnished by the ovum itself, so as the laws laid down by men become a measure and rule of conduct for men, the egg-capsule, although itself without any formative power, becomes in its rigid form the essential regulator of the position of the developing embryo of *Lepas* in the egg. — *Sitzungsberichte der kön. preuss. Akademie der Wissenschaften zu Berlin*, December 8, 1887, pp. 1052–1055.

*On the Infection of a Frog-tadpole by Saprolegnia ferax.*

By Prof. J. B. SCHNETZLER.

In a glass vessel containing 2 litres of water, in which the oxygen was continually renewed by aquatic plants, the author had two frog-tadpoles which had not undergone their transformation since last year (1886). However, the branchiæ had disappeared, and the tadpoles came to the surface of the water to respire air. These larvæ were nevertheless very lively, and their dejections proved that nutrition was effected in a normal fashion. As the volume of water and the quantity of food have a marked influence on the development of the larvæ of frogs, the author removed one of these tadpoles and placed it in a second vessel with aquatic plants. Both vessels were of ordinary white glass.

The two larvæ remained very lively without undergoing any metamorphosis, until, towards the end of last June, a fly (*Sarcophaga carnaria*) was placed in the first vessel. After death its body became covered with white filaments of *Saprolegnia ferax*. The tadpole, which had continued very lively up to this time, now soon became more sluggish in its movements; its body became quickly covered with filaments of *Saprolegnia*, and within two days after this infection it was dead.

Microscopic examination of the *Saprolegnia ferax*, which covered the body of the fly, showed that the protoplasm of its filaments was transformed into thousands of zoospores, which, by means of their two vibratile cilia, rapidly diffused themselves through the water. As these zoospores swim about and thus spread themselves through

the water, a single dead fly may become a focus of infection for a great number of aquatic animals (fishes, newts, &c.). The whole surface of the tadpole above mentioned was covered with *Saprolegnia*, so that death must have been produced by the suppression of the action of the skin. The second larva, placed in a separate vessel before the introduction of the fly, remained quite intact.—*Séance de la Soc. Vaudoise des Sci. Nat.* July 6, 1887; *Bibl. Univ.* November 15, 1887, p. 492.

*On the Significance of Sexual Reproduction.*

By Dr. B. HATSCHKEK.

Dr. Hatschek recently lectured upon this subject before the meeting of German surgeons in Prague.

In the first place he indicated that the most important and probably original of vital phenomena was *assimilation*. By the process of assimilation new living particles (that is to say particles which in their turn possess the faculty of assimilation) are produced. Assimilation is, as Hatschek affirms, *the sole known mode of production of fresh living substance*. We see in the Amœbæ and other unicellular organisms that the parent-creature divides into two daughter-organisms. In the more complex multicellular organisms reproductive bodies in the form of germs and buds are produced; these are developed, and grow into new individuals of the same kind. In the latter instance, however, the formation of such germs is reduced to a process of division of the same kind as occurs in the unicellular organisms, only that in those cases where we have to do with production of ova, spermatozoa, and buds the portions divided off are very unequal in size. This difference, however, is due to no principal distinction.

Besides division, however, the contrary phenomenon occurs in unicellular organisms, namely the fusion of two originally separate individuals into a single one. This is the so-called "conjugation," which is very widely diffused among the Monoplastida. In the multicellular organisms it is the portions characterized as reproductive bodies that become fused together, therefore the individualities in their simplest state. The conjugation of the unicellular organisms represents the process of fecundation, but *not the copulation of the multicellular forms*.

The intermixture of the individualities is most generally diffused throughout the organic world; and although among multicellular animals we frequently meet with asexual modes of reproduction (such as gemmation, division with regeneration, and parthenogenesis), we find this always only along with sexual reproduction, *i. e.* alternating therewith.

When we find any process generally occurring in organisms the question of its significance involuntarily forces itself upon us. We ask directly, What does this arrangement do for the organism, what purpose has it for it? After citing and criticizing the views of Bütschli, Hensen, van Beneden, and Weismann, Hatschek expresses his own theoretical opinion, namely *that in sexual reproduction we must recognize a remedy against the action of injurious variability*.